SALMONID ENHANCEMENT PROGRAM
1990 - 1991 UPDATE

Fisheries and Oceans Pêches et Océans

BC MINISTRY OF ENVIRONMENT

Canada

93-01930/

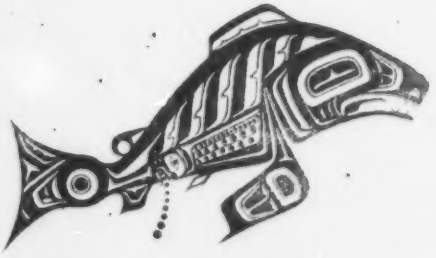
YOUR CHILDREN — SEP'S BEST RESOURCE

ENHANCEMENT HAS MANY FACES, BUT NONE HOLD AS MUCH PROMISE FOR THE FUTURE AS THE FACES OF THE CHILDREN WHO COME IN CONTACT WITH ENHANCEMENT EACH YEAR. THE CONTACT MAY BE BRIEF OR LENGTHY BUT IT IS ALWAYS MEANINGFUL, FOR CHILDREN, BETTER THAN ANY OF US, RECOGNIZE AND APPRECIATE THE WONDERS OF EARTH'S OTHER CHILDREN.

The young come face-to-face with SEP in many ways — they learn, using the curriculum materials *Salmonids in the Classroom*; they experience, through the anticipation and excitement of a classroom incubation project; they observe, during field trips to spawning streams or hatcheries and they work, hands-on, to improve the environment by marking neighbourhood storm drains.

SEP's links with formal education in B.C. are strong, based on the curriculum packages and supported by a lively array of activities and audio-visual materials that supplement the lesson materials. It has been estimated that, since SEP's first entry into classrooms in 1978, more than one million children have been introduced to the salmonid resource through ***Salmonids in the Classroom***. Many others have discovered salmonids through field trips or participation in public involvement projects in their towns or cities. Their understanding of and concern about environmental issues is a source of inspiration to all of us.

This year, we want to share that source of inspiration with you. The photographs on our pages feature many young faces captured during their encounters with our salmonid resource.



DEPARTMENT FISHERIES AND OCEANS

Salmonid Enhancement Program

400 – 555 West Hastings Street

Vancouver, BC V6B 5G3 Canada

PRODUCED BY:
New Communication Concepts

DESIGNED BY:
Cochrane & Cassidy Design Ltd.

ART BY:
BC School Children

© Ministry of Supply & Services
Canada 1992

Cat. No. Fs 1-56/1990E
ISBN 0-662-19387-3

TABLE OF CONTENTS

PAGE

DIRECTOR'S REPORT ..... TWO

MASS CONTINUES ITS PROBE
OF THE "BLACK BOX" ..... THREE

QUINSAM SEA PENS ARE A
COOPERATIVE EFFORT ..... FOUR

WORKING TOGETHER WORKS AT NITINAT ..... FIVE

OXYGEN AIRLIFTED TO SAVE FISH
AT GLENDALE ..... SIX

LESS MESS IS WEAVER'S GOAL ..... SEVEN

CHANNELS ARE SALVATION OF
CHILLIWACK CHUM ..... EIGHT

WATER EVERYWHERE, BUT ALMOST
NONE WHERE NEEDED ..... NINE

HOW'S THIS FOR A FISH STORY? ..... TEN

ANNUAL PRODUCTION SUMMARY
FISH PRODUCTION FROM SEP
FACILITIES: 1990 RELEASE YEAR ..... ELEVEN – FIFTEEN

NOTES ..... SIXTEEN

DIRECTOR'S REPORT

THE WORK OF ENHANCING WEST COAST SALMONIDS CONTINUED SUCCESSFULLY IN 1990-91, AND THERE WERE GOOD RETURNS, DUE IN PART TO PAST EFFORTS, TO MANY B.C. RIVERS, BUT THE YEAR WAS NOT WITHOUT CHALLENGES, MANY OF THEM WEATHER-RELATED.

The long, hot summer of 1990 threatened fish in the Glendale River and spawning channel. As water temperatures rose, oxygen content dropped, bringing the fish to the brink of suffocation. A willing SEP crew averted disaster, using tanks of liquid oxygen bubbled into the water. They had to stick with the effort for two weeks, but they kept the fish in the channel alive. Unfortunately, thousands in the river suffocated. Those that survived, in the channel and the river, will be critical for rebuilding the run after this natural disaster.

Fall; heavy rains, followed by floods. November 1990 was a repeat performance of November, 1989. This time, unfortunately, the damage was greater and repair costs totalled about $4 million. The most serious damage was at the Chilliwack River hatchery where the river changed course, moved away from the hatchery intake, damaged a well water supply line, and exposed clay banks at several locations. Rebuilding the intake and repairing other damage to the facility addresses only part of the problem. The newly exposed banks present an ongoing difficulty — heavy siltation of the river.

Floods in June 1990 virtually flattened the Skeetchestn Band's new hatchery on the Deadman River near Kamloops. Undaunted, the Band put 130 thousand chinook eggs into Spius Creek hatchery for incubation, then rebuilt and reopened the Skeetchestn hatchery — in time for the November coho run. The facility also continued to fill a valuable training and education role in the Kamloops area.

The Chinook Rebuilding Program remains a high priority for SEP and upgrading of the Cowichan hatchery to increase chinook production continued in fiscal 1990-91. Completion is expected in 1991.

Like all federal government programs, SEP has felt the impact of the federal deficit. While still benefitting from $53.7 million from Western Economic Diversification, SEP has suffered budget cuts. The second round came in February and led to closure of the experimental Clearwater River hatchery, a 50 percent reduction at Quesnel River (also experimental) and reduction of operations at some spawning channels. There were other minor cuts throughout the program, but our objective of protecting most of our major production and community programs was met.

The scarcity of funds severely limits our capability to undertake new projects. To avoid having to close some operations, alternative funding sources, including industrial sponsorships, will be explored when and where feasible. We have begun to develop a new 10 year plan for SEP and alternative funding options will be one of the elements to be considered as it takes shape.

There was one economic bright spot last year, as volunteer programs received assistance through full implementation of the Community Ventures program. All available funds were employed to allow several community based projects to realize their full production potential.

Another highlight was the continued growth of SEP's education activities, with production of French versions of *Salmonids in the Classroom* (Primary and Elementary) and expansion of the classroom incubation program in most areas of the province. These efforts to create awareness in the young are one of SEP's most promising long-term investments.

Throughout the year, despite the difficulties of rampaging rivers and diminishing dollars, SEP staff continued the make enhancement of the resource their main priority and their steadfast, and often outstanding, efforts were rewarded with a high level of production from hatcheries, spawning channels and community projects.

MASS CONTINUES ITS PROBE OF THE "BLACK BOX"

MASS (MARINE SURVIVAL OF SALMON PROGRAM) IS A RESEARCH PROGRAM, WITH SEP INVOLVEMENT, THAT HAS BEEN OPERATING IN THE WATERS IN BARKLEY SOUND AND ALONG THE WEST COAST OF VANCOUVER ISLAND EACH SPRING/SUMMER SINCE 1987. ITS AIM IS TO LEARN MORE ABOUT THE FACTORS THAT AFFECT JUVENILE SALMON AFTER THEY LEAVE THEIR NATAL RIVERS OR SEP HATCHERIES AND ENTER THE PACIFIC OCEAN.

Obviously, a greater understanding of factors that affect survival of young salmon would be of immense value to SEP hatchery managers who must plan release strategies and to fisheries managers who must estimate returns and determine appropriate fishery harvest levels.

Examining what occurs in even a small portion of the vast ocean environment is a huge, and difficult, undertaking. MASS has probed many factors within that environment, at least along a portion of the west coast of Vancouver Island: ocean currents, salmon feed sources, migration patterns, water salinity, water temperature, and the impact of known salmon predators have all been studied.

Although it takes a long time to complete the field work and analysis for such a massive study, a few facts have been discovered over the first four years.

MASS has studied predation on juvenile salmon by Pacific hake, walleye pollock and spiny dogfish. Results from the four years up to and including 1990 indicate the Pacific hake are the most important predators on juvenile salmon in this study area. It appears that this species may have a major impact on over-all marine survivals. The truth of that assumption will be tested when chinook and sockeye salmon that went to sea from 1987 to 1990 return as adults. For example, in 1990, hake populations were the lowest seen over the four years MASS has operated so, if hake predation is a major factor, returns should be highest for the 1990 smolts.

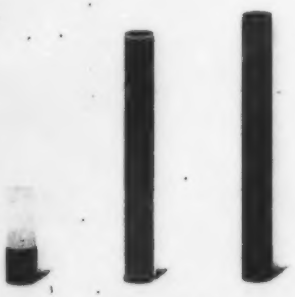
Assumptions about hake predation are being tested also through experimental releases of hatchery-reared chinook at selected sites in Barkley Sound to see if smolts released in sites free of hake survive at higher rates than those that encounter significant hake populations. Results will accumulate from 1991 through 1994.

Factors affecting survival of sockeye at both ends of the life cycle have been studied in and around Barkley Sound. In general, juvenile survivals appear to be related to marine environment, rather than rearing stream conditions. Predicted returns, based on the impact of marine salinity factors, have been within seven percent of actual returns over the past four years. Predation, growth rates, size at release, location of sea entry and variations in size at migration have also been studied.

Very high mortality rates among returning adult sockeye in 1990 prompted a team of MASS researchers to investigate the causes. Several factors were involved — unusually high water temperatures in the coastal waters, low oxygen levels, delayed migration through the lower Somass River, high temperatures and low flows in the river itself, high concentrations of parasites combined with algae blooms in the Alberni Inlet and Barkley Sound. The ultimate significance of the event will be defined when juvenile lake populations are assessed in Lake Enrichment Program studies for 1991. This event, however, has served to emphasize the need for research into marine impacts on adult, as well as juvenile, salmon.

Some important questions about migration of juvenile salmon along the west coast of Vancouver Island are being studied also. Sample fisheries were conducted along the west coast of the island, across Queen Charlotte Sound and up the lower west coast of the Queen Charlotte Islands. Distribution of sockeye, pink, chum, coho and chinook has been plotted in an effort to determine the migration route favoured by each species.

The ocean yields its secrets slowly, but each small bit of information about that vast and complex environment is a valuable tool in the effort to preserve and enhance the salmonid resource.



SEP CONTRIBUTION TO 1990 COMMERCIAL CATCHES

SOCKEYE		
	NORTH COMMERCIAL	
	TOTAL CATCH	3,047,780
34.6%	SEP CATCH	1,053,922
	SOUTH COMMERCIAL	
	TOTAL CATCH	11,171,682
1.0%	SEP CATCH	117,191
	TOTAL COMMERCIAL	
	TOTAL CATCH	14,219,462
8.3%	SEP CATCH	1,171,113

QUINSAM SEA PENS ARE A COOPERATIVE EFFORT

QUINSAM HATCHERY'S EFFORT AT CHINOOK STOCK REBUILDING ON THE EAST COAST OF VANCOUVER ISLAND IS GETTING HELP FROM THE APRIL POINT GUIDES ASSOCIATION. IT IS CLEARLY A SIGNIFICANT RELATIONSHIP — FISHING GUIDES HAVE AN OBVIOUS INTEREST IN THE HEALTH OF FISH POPULATIONS.

The cooperation started four years ago, when April Point Lodge agreed to install net pens at one of the dock sites and hold chinook smolts for two to three weeks of pen rearing.

"It started when six of our guides suggested holding a ladies invitational derby, with the focus on tyee," says Rich Chapple, operations manager for April Point Lodge, "With all these events, we include an enhancement element. For this one, we wanted to direct part of the entry fees to a project that would have a direct tie-in with the event itself. We talked to Jim Van Tine at Quinsam and he suggested this project. Sea pen rearing for chinook was a fairly new idea then, but we started with about 70 thousand smolts in 1988. It seemed to work, so we kept at it; this year we reared about 700 thousand!"

Smolts, all Quinsam River stock, are the hatchery's contribution to the cooperative effort. The pens, floats, site, tagging costs and labour for feeding come from April Point Lodge and the Guides Association. Last year the Fishing Vessel Owners Association contributed to the cost as well. The fish are brought to the site at a size of about 5 grams.

"We rear for two months in the hatchery, then send part of the brood over to the pens," says Mark Trenholm at Quinsam, "They feed them there for two to three weeks before release. The sea pens really help the fish get a good start, protecting them from predators while they adapt to salt water. With that help, they can achieve some really good growth."

The pens are located in Goose Bay behind April Point. It is a protected area and the smolts seem to grow very well, reaching an optimum release size quickly.

SEP CONTRIBUTION TO 1990 COMMERCIAL CATCHES

CHUM		
	NORTH COMMERCIAL	
	TOTAL CATCH	1,578,086
18.3%	SEP CATCH	288,613
	SOUTH COMMERCIAL	
	TOTAL CATCH	1,594,600
44.0%	SEP CATCH	701,735
	TOTAL COMMERCIAL	
	TOTAL CATCH	3,172,686
31.2%	SEP CATCH	990,347

Enthusiasm for the project remains high and Chapple says the group is hoping to release one million smolts in 1992. A new source of funds, contributed in memory of a long-time regular guest of April Point, is helping to finance that dream.

Although the majority of the first release from the pens in 1988 will return in 1992 as five-year-olds, some tagged four-year-olds were caught near April Point in 1991.

"We sent the heads in," said Chapple, "Now we are waiting to see if any of them were our fish!"

When the head-recovery data came through, it showed fish from the April Point pens were not only caught near their source; they were turning up in sport and commercial catches over a large area of the coast. It seems the experiment will be a success.

WORKING TOGETHER WORKS AT NITINAT

"WE'RE PRETTY ISOLATED HERE," SAYS NITINAT HATCHERY MANAGER ROB BROUWER.

It *is* off the beaten path; from Port Alberni you follow the Bamfield road until you come to the Nitinat Lake turn-off, then you travel several more kilometres to the hatchery site at the confluence of the Big and Little Nitinat rivers. It's gravel all the way and takes about an hour.

There aren't many job opportunities in the area once you get there, either; some logging, a little fishing and mining, a bit of parks work on the West Coast Trail... in this environment, the hatchery is a significant employer.

"Not many people want to come all the way out here for a part-time job," says Brouwer, "It just makes sense for us to get good people locally and give them the training to work for us. That way, we increase the future job opportunities of the people, Native and non-Native, in our community."

The hatchery, which produces chum, chinook and coho, has been training and hiring members of the Ditidaht (Nitinat) Band for fish culture work since the facility was built in 1980. The pace of that activity has been increasing over the past five years, with the Band providing workers, under contract, to help with the egg-takes, rearing, coded-wire tagging, and doing extensive assessment work.

"I wanted us to hire more of the Native people here," says Brouwer, "I think it really works for the hatchery."

"We are very pleased by how it's working with the hatchery," says Band councillor Jack Thompson, "They work very well with the Band and keep us well informed about what they're doing. We usually have about four to eight people working at the hatchery over the winter and our people are getting trained into the system."

The training is both formal, with experts coming to the site to put on week-long sessions, and on-the-job. Most aspects of fish culture are involved; broodstock capture, egg-takes, incubation and rearing. The most recent addition to the local pool of skilled labour has been a group of six women from the Band who handle the coded-wire tagging and fin clipping of more than a half a million fry each year. As well, working with local fishery officers, Band members undertook a chinook creel census on Nitinat Lake in 1990 and are doing river escapement estimates and stream surveys.

For a hatchery that operates entirely on pumped water, sea-pen rearing for both chinook and sockeye is an alluring prospect. It is also one that will see strong Native participation as the Band becomes involved in construction and operation of pens in Nitinat Lake (actually a salt-water fiord).

"The Band will be rearing millions of chinook in the pens," says Brouwer, "Using sea pens will greatly reduce our operating costs for a given number of fish because we will have to pump much less water." In the future, the program will enhance Sarita River chinook, satellited to Nitinat, for return to their native stream as smolts.

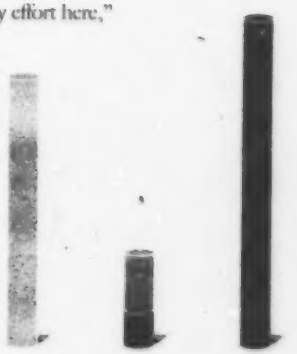
The Ditidaht Band is also working with Pacific Biological Station on a Hobiton River sockeye study and will raise sockeye smolts in net pens to increase survivals and for scientific study. With enough skilled hands available, the facility is beginning to do some work with local steelhead populations, too.

"Capturing steelhead broodstock is strictly a voluntary effort here," says Brouwer, "With the help the Band gives us, we have been able to get started on it and I hope we can continue, although the other species will remain our focus"

The Native involvement seems to be working for everyone.

"Native people are involved with all our activities here," says Brouwer, "We appreciate the community involvement and it has been a real benefit to us to have good local workers to call on."

"Our people are getting training they want and we are seeing good returns of fish here, too," says Thompson, "Our people are happy about that."



SEP CONTRIBUTION TO 1990 COMMERCIAL CATCHES

PINK		
	NORTH COMMERCIAL	
	TOTAL CATCH	12,848,432
0%	SEP CATCH	0
	SOUTH COMMERCIAL	
	TOTAL CATCH	3,464,620
41.4%	SEP CATCH	1,435,549
	TOTAL COMMERCIAL	
	TOTAL CATCH	16,313,052
8.8%	SEP CATCH	1,435,549

OXYGEN AIRLIFTED TO SAVE FISH AT GLENDALE

AS THE LONG, HOT SUMMER OF 1990 DELIGHTED SUN- WORSHIPPERS, SEP STAFF FACED A LIFE-OR-DEATH EMERGENCY IN THE GLENDALE RIVER AND SPAWNING CHANNEL.

As one hot, sunny day followed another, water levels dropped and temperatures rose. The entire system was drying out and heating up just as a major pink run was making its way into the river. Soon there were 80 to 100 thousand pinks in the channel, about 130 thousand in the river above it and 100 thousand below. All were in danger.

Harry Genoe, manager of Puntledge hatchery, was supervising the Glendale channel and he could see a disaster coming. A hasty phone call brought help from Barry Chilibeck (SEP Development Division), Bill McLean (support biologist, Coastal Operations) and consultant Rob Barrett of Point Four Systems. They arrived at Puntledge with a bunch of ceramic plate diffusers, lots of hose, meters, tanks of pure oxygen and an idea. They were going to attempt to do for an entire spawning channel what is routinely done for an aquarium tank — oxygenate it.

"We built a grid for the diffusers and tested it at the hatchery," says Chilibeck, "Then we flew into Glendale and installed the system near the head of the channel, in an area where the water was still fairly deep. We tested with meters and found that the diffusers were able to raise the oxygen content throughout the channel. All the fish in the channel survived and most of the ones just below the channel, where the aerated water flowed out. Those fish just hung in that flow. They wouldn't even try to go out into the river water! The system let us maintain that population of fish."

Once the oxygen system was working, a daily helicopter flight was set up to fly in a full tank of liquid oxygen and remove an empty each day — the tanks are just too big and heavy to fly in several at a time. Then the rescue team turned to the secondary problem — low water flows.

"We figured that we needed about two weeks worth of assured water," says Chilibeck, "We were pretty sure of rain after that. There is a weir at Tom Browne Lake to supply water for the channel, but the lake was getting dangerously low, so we went looking for a water source. There are a lot of hanging lakes in the mountains behind there, and we found one, Martin Lake, that was behind a big beaver dam. We just cut an opening through the dam and got a big enough block of water down to Tom Browne to keep the channel flowing."

The operation, at a cost of about $25,000, ran for about two weeks and saved the fish in and below the channel. Then the rains came and the world returned to normal. For the DFO rescue team, there was just one more obligation; they had to choose one of their members (Harry Genoe) to fly to Ottawa in January 22, 1991 to accept an Award of Merit for their efforts.

What *would* have happened without them was clearly demonstrated in the river above the channel (and its life-giving oxygen system):

"It was pretty incredible," says Chilibeck, "One day the fish were all there. The next day it was just white bellies."

SEP CONTRIBUTION TO 1990 COMMERCIAL CATCHES

COHO		
	NORTH COMMERCIAL	
	TOTAL CATCH	1,545,596
10.5%	SEP CATCH	161,947
	SOUTH COMMERCIAL	
	TOTAL CATCH	2,308,791
11.2%	SEP CATCH	259,079
	TOTAL COMMERCIAL	
	TOTAL CATCH	3,854,387
10.9%	SEP CATCH	421,026

LESS MESS IS WEAVER'S GOAL

ALL RIVER WATER CONTAINS SUSPENDED SILT, SCOURED FROM THE BANKS ALONG FAST-FLOWING SECTIONS. ANYWHERE THE WATER FLOW SLOWS, THAT SILT IS DEPOSITED ON THE STREAMBED. THAT TRICK OF NATURE BUILT THE ENTIRE FRASER RIVER DELTA. ON A MUCH SMALLER SCALE, IT CREATES A PROBLEM FOR SEP SPAWNING CHANNELS.

Over time, all spawning channels get loaded with silt. During periods of normal water flows, silt accumulates slowly. When flood events occur, however, the volume of silt in the water increases dramatically and large amounts of it can build up quickly as water speed slows in the flow-controlled channels.

When gravel in a spawning channel becomes heavily coated with silt, it must be cleaned. If the silt remains, it will interfere with spawning or keep eggs in the redds from receiving enough oxygen. All SEP channels are monitored for silt build-up and are cleaned when necessary. In many cases, this is an annual routine.

At Weaver Creek, in the Lower Fraser Valley, the cleaning is done by a large machine that pumps air and water into the gravel to flush out the silt.

"We start at the top of the channel and literally 'chase' the silt down to the bottom end." says manager Victor Ewert. It is effective but Ewert has been interested in finding a better way to deal with the problem. There are two very good reasons to try to reduce or avoid the cleaning operation. One is financial; the other, environmental.

Obviously, any operation that involves equipment and labour has a cost and any reduction of such operations leads to savings. That is the financial motivation.

"At the end of the process, you're sending dirty water downstream," says Ewert, "it may be natural dirt, but dirt it is. That's an environmental concern. We are fortunate in that we do not have groups using the water downstream from our site. But in some locations, high levels of effluent from these cleaning operations are just not acceptable."

Cleaning is usually done in the spring or early summer, right after fry migrations, when there is a lot of water available to use in the operation and there are high natural flows to dilute the effluent as it leaves the site. Still, the operation releases dirty water and the overall environment would be better served if that were reduced or eliminated.

Weaver Creek has been investigating ways to tackle the problem. One is a "dry cleaning" method. A large, perforated, tumbling device, of the type used in gold mining operations, has been tested. With this method, the silt is knocked off the gravel and a small volume of water, under pressure, flushes the material onto the berm, rather than back into the stream.

Another option is to solve the problem at the source. We know that turbid water, experienced during high flows, greatly increases the amount of silt that is deposited in spawning channels. Allowing less of the dirty water into the channel would reduce the deposits — and the need for cleaning.

"I felt that if we could reduce the water flow to a minimum safe level — one that would still supply eggs with enough oxygen — we could also reduce the amount of silt that is introduced into the channel," says Ewert. "We have a system of slotted pipes, standing in the gravel, that allows us to draw off samples from egg depth (about 25 cm, or 10 inches) to check how much dissolved oxygen is being delivered to the eggs. Using that, and checking every week, we had considerable success last year with reducing the water flows. Usually, during the winter, we operate at a flow of 340 litres per second. In 1990, we were able to reduce that to about 170 litres per second. We were reluctant to go lower, especially near hatch stage when oxygen demand is highest, but we hope to get a system of daily oxygen monitoring in 1991 that would allow further reductions."

Ewert feels that this approach would be even more effective if it could be linked with a turbidity monitoring arrangement to alert staff of increasing silt levels in the water. For now, Weaver Creek staff simply estimates, based on when a heavy rainfall starts and stops, and on their own local knowledge, to predict when dirty water will reach the channel.

"I would estimate that this approach could eliminate about 75 percent of the siltation we experience — maybe more," says Ewert.

It's another small, but significant, way to clean up the world we live in.

CHANNELS ARE SALVATION OF CHILLIWACK CHUM

THE CHILLIWACK/VEDDER RIVER SYSTEM IS FAMED FOR SEVERAL REASONS; ITS NATURAL BEAUTY, ITS WINTER STEELHEAD RUNS, AND ITS TENDENCY TO DRAMATIC FLOOD EVENTS. LESS WELL-KNOWN, BUT IMPORTANT, IS THE SYSTEM'S CHUM SALMON PRODUCTION. UNFORTUNATELY, THAT PRODUCTION OFTEN FALLS PREY TO THE SYSTEM'S FLOOD EVENTS.

"The chum and the floods just seem to hit the river at the same time," says SEP biologist Matt Foy, "In 1989 and 1990, the mid-November floods were perfectly timed to wipe out spawning chum. In cases like that, the work we have been doing in the area since 1978 really makes a difference."

The work SEP has been doing involves both the Chilliwack River hatchery and the Resource Restoration Division. Together, they have done a lot to offset losses from severe flood events.

The Resource Restoration Division's channel program started with work on Hopedale Slough and Ryder Creek in 1978. Then, in the 1980s, they built groundwater-fed channels on Peach Creek and Hopedale Creek, both on the Vedder system. In 1990, the target for improvement was Upper Barrett Creek and in 1991, work continued on Usher Channel.

The side channels provide protected spawning grounds. During the most severe floods, these channels are the only spawning areas available for chum in the lower river.

Chilliwack River hatchery plays a role, too. The hatchery releases approximately two and one-half million chum fry annually. When they return as adults, these fish bolster the number of chum available to spawn in the system of channels and in the river.

"It is a good place for SEP's multi-technique approach," says Foy, "The hatchery and channel production complement each other — and the natural production. The channels recycle the hatchery fish, and both provide an insurance policy for catastrophic events. During the disastrous flooding in November 1990, when Peach Creek alone contained 20 thousand spawners, the side channels were the major source for hatchery broodstock."

"Those channels can really help stabilize wild runs in rivers like these," says Chilliwack hatchery manager Don Buxton, "Chum are very opportunistic and will readily move into the channels when river conditions are poor."

"In 'normal' years, these channels probably produce about 20 percent of the system's chum output," says Foy, "But in a year like 1990, with very heavy floods destroying the natural spawning grounds, channels may account for the major portion of this system's production.

SEP CONTRIBUTION TO 1990 COMMERCIAL CATCHES

CHINOOK		
	NORTH COMMERCIAL	
	TOTAL CATCH	256,533
26.4%	SEP CATCH	67,846
	SOUTH COMMERCIAL	
	TOTAL CATCH	418,217
16.9%	SEP CATCH	70,055
	TOTAL COMMERCIAL	
	TOTAL CATCH	674,740
20.5%	SEP CATCH	138,397

WATER EVERYWHERE, BUT ALMOST NONE WHERE NEEDED

MANY SEP FACILITIES WERE HARD-HIT BY FLOODS IN NOVEMBER 1990; THE CHILLIWACK RIVER HATCHERY WAS CLOBBERED. BUILDINGS, TROUGHS AND REARING CHANNELS SURVIVED AS THE SUDDENLY-WILD RIVER ATTACKED ITS BANKS, BUT THERE WAS A REAL AND IMMINENT DANGER THAT THE WATER INTAKE WOULD BE ABANDONED BY THE SHIFTING RIVER. FOR A MANAGER WITH A HATCHERY FULL OF EGGS, THIS IS A NIGHTMARE SCENARIO.

"We were in real danger of losing our water supply," says Chilliwack manager Don Buxton, "Fortunately, someone on the night shift found a piece of machinery that would work and built a bit of a dyke. That let us get some flow going, but it was still vulnerable. We needed more. With the roads washed out, they had to 'walk' a bigger machine into us — it took about 20 hours! That got us back in shape. Even so, our situation is precarious, so this summer we will be building a new intake. It's a reminder, I guess, we just get to thinking we have everything set and nature lets us know our limits!"

For SEP, once the floodwaters subsided, the nightmare did not go away — it just became a bad dream for the engineers and financial planners.

The partial report below is terse, written for engineers, but its factual style hints at the rampage that nature indulged in 1990, and gives a rough idea of the scope of repairs required.

Chilliwack: Recent floods have lowered the river bed so that without emergency repairs the intake would have been inoperable. In addition, the risk of the river changing its course and bypassing the intake has increased.

Repairs: Completed in 1991, at a cost of $2,000,000.

Chehalis: Floods have scoured gravel upstream of the hatchery and deposited it adjacent to the hatchery. Flood elevations are now approximately two metres higher than before.

Repairs: Completed in 1990, at a cost of $75,000.

Kakweikan Channel: Last fall the river moved away from the intake and created a much larger channel in the opposite bank with a large gravel bar preventing flow to the left bank of the river and the intake.

Repairs: Completed in 1991, at a cost of $150,000.

Phillips Channel: Floods have brought down a large amount of sand from an extremely active stream nearby; the lake outlet has also been scoured down.

Repairs: Completed in 1990, at a cost of $75,000.

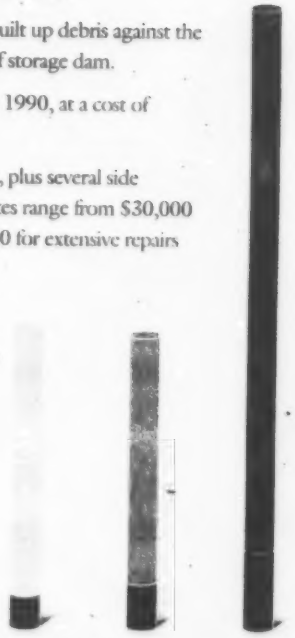
Netike Channel: A combination of high flood levels and a debris torrent has scoured out the river adjacent to the intake and deposited fines in the top third of the channel.

Repairs: Completed in 1991, at a cost of $150,000.

Mitchell Flow Control: A high lake level built up debris against the structure and blew out a 12-metre section of storage dam.

Repairs: Temporary measures completed in 1990, at a cost of $30,000.

The list goes on; a total of 16 major projects, plus several side channels, were damaged. Repair cost estimates range from $30,000 (to replace baffles at a fishway) to $2,000,000 for extensive repairs and added protection at the Chilliwack River hatchery. The total repair cost will be in excess of $3.8 million. Keeping up with nature can get very expensive.



SEP CONTRIBUTION TO 1990 COMMERCIAL CATCHES

ALL SPECIES		
	NORTH COMMERCIAL	
	TOTAL CATCH	19,276,427
8.2%	SEP CATCH	1,572,328
	SOUTH COMMERCIAL	
	TOTAL CATCH	18,957,900
13.6%	SEP CATCH	2,584,104
	TOTAL COMMERCIAL	
	TOTAL CATCH	38,234,327
10.9%	SEP CATCH	4,156,432

HOW'S THIS FOR A FISH STORY?

"IF YOU CATCH A 50-POUND (23 KG) CHINOOK AROUND HERE, NOBODY PAYS ANY ATTENTION," SAYS KITIMAT HATCHERY MANAGER DAVE MCNEIL, "EVEN FISH AT 60 POUNDS ARE QUITE COMMON."

What *did* attract a bit of attention was the 72-pound (33 kg) marked chinook that was sport-caught in 1989. That one made the front page of the paper in Williams Lake.

The hatchery can take most of the credit for the strong return of Kitimat system chinook. The giant five-year-old fish were nearly gone from these waters before the hatchery began building up the numbers. Today, with hatchery output at about three million juveniles each year, the big fish are back.

Back, too, are the pleasures of steelhead fishing on the Kitimat. Three years ago — the same year that the first returns of hatchery-produced steelhead were due — Fish and Wildlife instituted a "no-kill" fishery for wild steelhead in the area.

"We were a bit worried," says McNeil, "Everyone wondered if there would be enough hatchery steelhead to satisfy the sport fishing demand. As it turned out, the hatchery fish have returned very strongly. Now it's a growing fishery."

With really strong runs of marked steelhead, and a top weight of 12 kilograms (27 pounds) in each of the last three years, it is easy to see why the Kitimat area is becoming popular with sport fishing enthusiasts.

"A few years ago, there were four or five fishing charter businesses here," says McNeil, "Today there are about 60! There is really good fishing out in the salt water. The creel survey this year showed a catch per unit of effort ratio of 1 to 1.1; *statistically*, everyone with a line in the water caught a fish!"

With those huge five-year-old chinook appearing again, and strong steelhead runs, Kitimat is enjoying a sport fishing boom.

"Most people, especially the charter and tackle people, are really happy about it," says McNeil, "but there are those who find it's getting too crowded. I guess now we'll have to deal with the problems of success."

SEP CONTRIBUTION TO 1990 GEORGIA STRAIT SPORT CATCHES

COHO		
32.1%	TOTAL CATCH	630,032
	● SEP CATCH	202,403
CHINOOK		
19.2%	● TOTAL CATCH	111,914
	● SEP CATCH	21,456

Species	Juveniles Released	Expected Adults	Canadian Catch
Community Economic Development Program			
ALOUETTE RIVER			
PINK	729,299	10,939	5,399
CHUM	720,929	12,256	5,177
COHO	26,240	2,624	1,679
CHINOOK	492	4	3
CUTTHROAT	41,708	4,171	2,795
STEELHEAD	46,836	1,873	1,124
BELLA BELLA			
CHUM	1,120,647	21,292	14,755
COHO	130,114	10,626	7,515
CHEHALIS RIVER			
CHUM	2,540,593	17,784	7,512
CLAYOQUOT			
CHINOOK	156,000	2,184	1,038
COWICHAN RIVER			
COHO	230,743	2,307	1,644
CHINOOK	736,939	13,361	7,482
DEADMAN RIVER			
COHO	56,568	1,131	724
CHINOOK	94,101	843	253
FORT BABINE			
COHO	283,878	12,241	5,586
CHINOOK	72,640	1,453	603
FORT ST JAMES			
CHINOOK	125,319	940	282
HARTLEY BAY CREEK			
COHO	112,590	5,246	3,710
KINCOLITH			
COHO	74,728	7,473	3,680
CHINOOK	70,914	1,418	420
KISPIOX RIVER			
COHO	234,469	14,221	6,489
CHINOOK	164,469	1,749	725
KITSUMKALUM RIVER			
CHUM	49,235	837	562
COHO	129,056	5,866	2,677
KLEMTU			
CHUM	475,590	9,036	6,262
COHO	108,263	7,675	5,428
LANG CHANNEL			
PINK	84,000	1,260	932
CHUM	210,000	2,940	1,294
COHO	1,260	189	96
MASSET			
COHO	26,300	2,630	1,171
CHINOOK	192,483	2,117	762
NANAIMO RIVER			
COHO	248,212	2,482	1,768
CHINOOK	412,084	8,242	4,616
NIMPKISH			
CHUM	1,019,117	12,988	5,974
CHINOOK	218,314	1,637	1,042
OWEEKENO			
CHINOOK	436,624	5,239	2,386
P.HARDY/QUATSE			
PINK	1,707,769	25,617	15,370
CHUM	184,586	2,215	1,019
COHO	269,433	6,831	4,954
CHINOOK	138,483	2,770	1,764
CUTTHROAT	98	10	7
STEELHEAD	82,177	2,490	1,245
P.HARDY/STEPHENS			
CHUM	292,034	3,335	1,467
COHO	477,077	5,456	3,369
CHINOOK	319,854	2,399	1,140
PENNY			
CHINOOK	55,242	829	249
POWELL RIVER			
PINK	101,722	1,526	1,129
CHUM	733,618	10,707	4,711
COHO	175,777	15,470	7,825
CHINOOK	155,975	2,652	1,858
STEELHEAD	8,072	81	41
SAN JUAN RIVER			
COHO	879,144	23,124	13,753
SECHELT			
PINK	403,609	9,283	6,869
COHO	120,071	10,366	5,244
CHINOOK	137,441	2,336	1,636
SEYMOUR RIVER			
PINK	156,941	2,354	1,742
CHUM	66,385	733	323
COHO	47,750	4,775	2,415
CHINOOK	80,519	604	423
STEELHEAD	47,545	1,256	628
SKIDEGATE			
CHUM	45,755	549	234
SLIAMMON RIVER			
PINK	10,000	150	111
CHUM	509,000	8,653	3,807
COHO	109,028	7,377	3,732
TERRACE			
COHO	52,272	5,227	2,385
CHINOOK	337,970	4,044	1,677
THOMPSON RIVER NORTH			
COHO	98,475	5,515	3,529
THORNTON CREEK			
COHO	332,650	10,198	6,065
CHINOOK	298,600	4,180	1,986
TOBOGGAN CREEK			
COHO	183,546	12,595	5,747
CHINOOK	137,172	2,428	1,007
STEELHEAD	14,818	148	89
VANCOUVER BAY			
PINK	958,878	14,383	10,643
CHUM	17,200	292	128

Species	Juveniles Released	Expected Adults	Canadian Catch
COHO	41,550	4,155	2,102
CHINOOK	103,464	1,256	880
Enhancement Operations			
ATNARKO CHANNEL			
PINK	64,560	968	581
BIG QUALICUM RIVER			
CHUM	47,111,283	301,512	181,801
COHO	1,057,206	40,174	27,071
CHINOOK	6,378,336	49,759	27,957
CUTTHROAT	6,276	628	421
STEELHEAD	23,219	929	465
BIRKENHEAD RIVER			
CHINOOK	124,129	931	279
CAPILANO RIVER			
COHO	727,598	59,451	30,307
CHINOOK	2,715,925	43,915	24,844
STEELHEAD	32,725	781	391
CHEHALIS RIVER			
CHUM	11,018,844	138,837	33,969
COHO	815,304	85,686	60,315
CHINOOK	1,666,752	13,485	11,081
CUTTHROAT	33,331	3,333	2,233
STEELHEAD	109,656	4,016	2,410
CHEMAINUS RIVER			
COHO	50,469	505	340
CHINOOK	232,071	12,532	7,041
CHILLIWACK RIVER			
CHUM	4,929,589	55,942	16,629
COHO	1,828,481	246,845	173,757
CHINOOK	722,326	12,280	10,090
STEELHEAD	127,479	5,012	3,007
CLEARWATER RIVER			
CHINOOK	1,653,260	12,399	3,720
CONUMA RIVER			
CHUM	14,263,229	134,162	39,308
COHO	176,768	7,195	4,135
CHINOOK	1,335,130	11,326	5,990
EAGLE RIVER			
COHO	1,136,300	24,182	16,166
CHINOOK	788,868	6,810	2,043
STEELHEAD	11,746	117	70
FULTON RIVER			
COHO	112,573	2,340	1,068
SOCKEYE	135,301,000	1,339,480	500,966
GATES RIVER			
SOCKEYE	11,937,828	118,186	31,532
GLENDALE CHANNEL			
PINK	700,000	10,500	6,300
INCH CREEK			
CHUM	6,142,905	65,115	12,611
COHO	385,799	33,746	23,754
CHINOOK	130,607	1,567	1,161
CUTTHROAT	31,335	3,134	2,100
STEELHEAD	12,196	488	293
JONES CREEK			
PINK	2,097,159	52,429	25,878
CHUM	153,678	1,076	455
KITIMAT RIVER			
CHUM	5,407,071	152,479	40,002
COHO	485,547	24,277	17,456
CHINOOK	2,373,436	28,481	5,554
CUTTHROAT	3,158	316	212
STEELHEAD	50,583	2,023	1,012
LITTLE QUALICUM RIVER			
CHUM	28,014,413	145,675	69,774
CHINOOK	4,340,113	56,421	31,700
STEELHEAD	28,181	1,127	564
NADINA RIVER			
SOCKEYE	8,300,000	82,170	21,923
NITINAT RIVER			
CHUM	23,739,068	698,275	465,721
COHO	107,690	2,440	1,351
CHINOOK	10,252,836	46,547	24,617
STEELHEAD	1,122	11	10
PALLANT CREEK			
CHUM	14,003,508	141,435	55,228
COHO	365,093	19,681	8,332
PINKUT CREEK			
SOCKEYE	58,081,000	575,002	215,051
PITT RIVER UPPER			
SOCKEYE	4,492,872	41,346	11,031
PUNTLEDGE RIVER			
PINK	1,810,771	39,552	23,731
CHUM	2,846,983	38,719	22,998
COHO	2,194,155	71,467	49,591
CHINOOK	3,332,235	21,182	11,570
CUTTHROAT	2,441	244	163
STEELHEAD	94,086	3,110	1,555
QUESNEL RIVER			
COHO	61,284	3,617	2,418
CHINOOK	971,036	9,311	2,654
QUINSAM RIVER			
PINK	7,063,051	112,607	67,564
COHO	1,526,050	96,282	66,387
CHINOOK	4,374,139	58,935	30,100
CUTTHROAT	1,563	156	105
STEELHEAD	22,494	900	450
ROBERTSON CREEK			
COHO	1,195,149	41,830	23,053
CHINOOK	8,506,266	115,685	61,182
STEELHEAD	397,985	7,268	6,489
SETON RIVER			
PINK	32,498,040	812,451	401,010
SHUSWAP RIVER			
CHINOOK	1,137,605	8,532	2,560
SNOOTLI CREEK			
CHUM	7,444,203	179,356	133,870

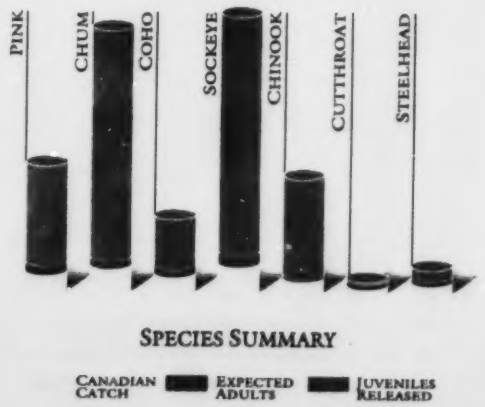
Species	Juveniles Released	Expected Adults	Canadian Catch
COHO	403,035	19,022	12,960
CHINOOK	2,196,312	16,472	6,424
CUTTHROAT	13,636	218	146
STEELHEAD	58,183	427	214
SPIUS CREEK			
COHO	475,833	13,103	8,384
CHINOOK	933,951	7,934	2,380
STEELHEAD	447,503	4,475	2,685
TENDERFOOT CREEK			
COHO	220,095	20,242	10,319
CHINOOK	908,304	8,744	5,765
STEELHEAD	97,643	586	293
WEAVER CREEK			
PINK	920,939	23,023	11,364
CHUM	931,467	6,520	2,754
SOCKEYE	21,662,845	214,462	56,646
WHITEHORSE			
CHINOOK	114,873	287	10
Public Involvement Program			
CENTRAL COAST			
COHO	85,777	2,114	1,495
GEORGIA STRAIT MAINLAND			
PINK	12,000	276	204
CHUM	1,024,160	11,016	4,846
COHO	406,411	13,655	6,909
CHINOOK	489,929	7,902	5,535
CUTTHROAT	8,099	810	543
STEELHEAD	23,533	466	233
GEORGIA STRAIT VANCOUVER ISLAND			
PINK	1,618,750	24,469	14,681
CHUM	119,610	858	376
COHO	782,153	21,824	15,550
CHINOOK	282,757	5,661	3,170
CUTTHROAT	1,500	150	101
STEELHEAD	19,800	792	396
JOHNSTONE STRAIT			
CHUM	111,500	1,781	819
COHO	485,758	5,290	3,837
CHINOOK	384,400	6,438	4,101
STEELHEAD	24,900	249	125
LOWER FRASER RIVER			
PINK	100,000	1,500	740
CHUM	476,400	5,970	2,522
COHO	150,856	6,460	4,135
CUTTHROAT	11,120	1,112	745
STEELHEAD	21,796	587	352
NORTH COAST			
COHO	60,720	3,614	393
CHINOOK	35,555	380	11
NORTHWEST VANCOUVER ISLAND			
CHUM	77,810	1,315	578
COHO	211,056	5,587	3,451
CHINOOK	1,510,774	18,942	9,001
STEELHEAD	31,615	578	520
QUEEN CHARLOTTE ISLANDS			
CHUM	105,642	1,662	708
COHO	329,453	6,154	2,738
RIVERS/SMITH INLETS			
CHINOOK	30,996	310	141
SKEENA RIVER			
CHUM	11,000	187	125
COHO	132,605	5,834	2,661
SOUTHWEST VANCOUVER ISLAND			
CHUM	2,600	18	8
COHO	597,186	14,176	8,430
CHINOOK	466,891	4,320	2,053
THOMPSON RIVER			
COHO	5,663	113	72
CHINOOK	139,090	283	85
UPPER FRASER RIVER			
COHO	24,870	497	318
CHINOOK	73,700	552	165
YUKON TERRITORY			
CHUM	990	7	
Resource Restoration Unit			
ALOUETTE CHANNEL			
COHO	2,400	360	230
ANDESIDE CHANNEL			
COHO	1,200	180	82
B.C. RAIL CHANNEL			
CHUM	585,000	8,190	3,604
COHO	3,510	527	267
BAYNES SOUND STREAMS			
CHUM	193,600	1,355	596
COHO	39,940	2,194	1,563
BILLY HARRIS SLOUGH			
CHUM	1,500,000	21,000	8,871
COHO	11,235	1,685	1,078
BONSALL SLOUGH			
CHUM	389,000	5,446	2,396
COHO	5,835	875	623
BRANDT CR CHANNEL			
CHUM	1,000,000	14,000	6,160
COHO	3,000	450	228
BRANDT CR DIVERSION			
CHUM	500,000	7,000	3,080
COHO	1,500	225	114
BRENNAN PARK CHANNEL			
CHUM	750,000	10,500	4,620
COHO	2,250	338	171
CHILQUA CREEK			
CHUM	239,000	3,346	1,414
COHO	1,440	216	138
ED LEON SLOUGH			
CHUM	1,450,000	20,300	8,575

Species	Juveniles Released	Expected Adults	Canadian Catch
COHO	8,700	1,305	835
ENGLISHMAN CHANNEL			
CHUM	250,000	3,500	1,540
COHO	3,750	563	401
ENGLISHMAN RIVER			
CHUM	1,288,000	9,016	3,967
COHO	181,299	1,813	1,292
CHINOOK	258,587	5,172	2,896
FISHWEIR CHANNEL			
PINK	250,000	3,750	2,775
HICKS CREEK POND			
CHUM	45,000	630	266
COHO	1,350	203	130
HIXON CHANNEL			
CHUM	80,000	1,120	493
COHO	1,200	180	91
HOPEDALE CHANNEL			
CHUM	1,251,572	17,522	7,400
COHO	47,342	1,280	819
HOPEDALE SLOUGH			
CHUM	167,500	2,345	991
COHO	2,513	377	241
IANSON CHANNEL			
COHO	302,260	3,339	2,137
JACK SLOUGH			
CHUM	1,140,000	15,960	7,022
COHO	3,420	513	260
JUDD SLOUGH			
CHUM	1,340,000	18,760	8,254
COHO	8,040	1,206	610
KAWKAWA CHANNEL			
PINK	150,000	3,750	2,775
CHUM	150,000	2,100	887
COHO	900	135	86
KITSUMKALUM LAKE			
SOCKEYE	250,000	2,475	926
KITWANCOOL CHANNEL			
COHO	2,040	306	140
MAMQUAM RIVER			
PINK	593,473	8,902	6,587
CHUM	1,500,000	21,000	9,240
COHO	4,500	675	341
MASHITER CHANNEL			
CHUM	645,000	9,030	3,973
COHO	3,870	581	294
MOODIE'S CHANNEL			
CHUM	678,000	9,492	4,176
COHO	10,170	1,526	772
OYSTER CHANNEL			
PINK	562,500	14,063	8,438
COHO	8,550	1,283	914
PARADISE CHANNEL LOWER			
CHUM	510,000	7,140	3,142
COHO	3,060	459	232
PARADISE CHANNEL UPPER			
CHUM	656,250	9,188	4,043
COHO	3,938	591	299
PEACH CREEK			
CHUM	1,625,000	22,750	9,610
COHO	9,750	1,463	936
PRETTYS CHANNEL			
CHUM	40,000	560	237
COHO	600	90	58
RAILROAD CREEK			
CHUM	192,500	2,695	1,138
COHO	1,155	173	111
ROTARY PARK			
CHUM	787,500	11,025	4,851
COHO	4,725	709	505
RYDER CREEK			
CHUM	112,500	1,575	665
SEABIRD CHANNEL			
CHUM	200,000	2,800	1,183
COHO	3,000	450	288
SOCKEYE	14,100	140	37
SEABIRD RIFFLES			
COHO	900	135	86
CHINOOK	30,000	60	49
SMOKEHOUSE CHANNEL			
CHUM	685,000	9,590	4,051
COHO	2,055	308	197
THURMAN CHANNEL			
COHO	301,200	3,180	2,035
TIAMPO CHANNEL			
CHUM	500,000	7,000	3,080
COHO	3,000	450	228
TOWER CHANNEL			
CHUM	500,000	7,000	3,080
COHO	1,500	225	114
VANCOUVER BAY CHANNEL			
COHO	510	77	39
WELDWOOD CHANNEL			
CHUM	555,000	7,770	3,419
COHO	1,665	250	126
WESTHOLME CHANNEL			
CHUM	986,000	13,804	6,074
COHO	5,916	887	632
WORTH CREEK			
CHUM	212,500	2,975	1,257
DEVELOPMENT DIVISION			
CHILKO RIVER			
SOCKEYE	1,606,000	15,899	4,242
EMBLEY CREEK			
PINK	48,750	1,365	819
COHO	187,500	1,500	1,088

Species	Juveniles Released	Expected Adults	Canadian Catch
KAKWEIKEN FISHWAY			
PINK	12,675,000	354,900	212,940
CHUM	18,900	132	61
COHO	375,000	3,000	2,176
SOCKEYE	30,000	300	168
CHINOOK	93,750	188	120
NEKITE RIVER			
PINK	1,125,000	16,875	12,656
CHUM	4,226,880	29,588	20,712
PHILLIPS CHANNEL			
PINK	4,125,000	61,875	37,125
CHUM	504,000	3,528	1,623
Lake Enrichment Program			
CHILKO LAKE			
SOCKEYE NOT AVAILABLE			
GREAT CENTRAL LAKE			
SOCKEYE	9,100,000	409,500	249,795
HENDERSON LAKE			
SOCKEYE	4,900,000	220,500	134,505
HOBITON LAKE			
SOCKEYE	374,000	16,830	10,266
KENNEDY LAKE			
SOCKEYE	1,040,000	46,800	28,548
LONG LAKE			
SOCKEYE	2,890,000	130,050	71,528
NIMPKISH LAKE			
SOCKEYE	10,670,000	480,150	268,884
WOSS LAKE			
SOCKEYE	2,200,000	99,000	55,440

Fish Production From SEP Facilities: 1990 Release Year

Species	Juveniles Released	Expected Adults	Canadian Catch
PROGRAM AREAS			
PROVINCIAL FACILITIES			
CUTTHROAT	172,516	14,116	9,457
STEELHEAD	339,909	8,946	4,776
COMMUNITY ECONOMIC DEVELOPMENT PROGRAM			
PINK	4,152,218	65,512	42,195
CHUM	7,984,689	103,617	53,225
COHO	4,449,194	185,800	103,287
CHINOOK	4,445,099	62,685	32,232
CUTTHROAT	41,806	4,181	2,802
STEELHEAD	199,448	5,848	3,127
ENHANCEMENT OPERATIONS DIVISION			
PINK	45,154,520	1,051,530	536,428
CHUM	166,006,241	2,059,103	1,075,120
COHO	13,324,429	812,085	537,164
SOCKEYE	231,722,418	2,294,057	814,871
CHINOOK	55,188,510	543,535	278,722
CUTTHROAT	91,740	8,029	5,380
STEELHEAD	1,514,801	31,270	19,908
DEVELOPMENT DIVISION			
PINK	17,973,750	435,015	263,540
CHUM	4,749,780	33,248	22,396
COHO	562,500	4,500	3,264
SOCKEYE	1,636,000	16,199	4,410
CHINOOK	93,750	188	120
PUBLIC INVOLVEMENT PROGRAM			
PINK	1,730,750	26,245	15,625
CHUM	1,929,712	22,814	9,982
COHO	3,272,508	85,318	49,989
CHINOOK	3,413,092	44,788	24,262
CUTTHROAT	20,719	2,072	1,389
STEELHEAD	121,644	2,672	1,626
LAKE ENRICHMENT			
SOCKEYE	31,174,000	1,402,830	818,966
RESOURCE RESTORATION UNIT			
PINK	1,555,973	30,465	20,575
CHUM	22,703,922	307,484	133,355
COHO	1,005,188	31,782	19,743
SOCKEYE	264,100	2,615	963
CHINOOK	288,587	5,232	2,945
SPECIES SUMMARY			
PINK	70,417,211	1,605,017	875,588
CHUM	203,667,372	2,529,013	1,295,263
COHO	22,077,383	1,115,463	710,943
SOCKEYE	255,608,518	3,624,740	1,605,190
CHINOOK	63,411,483	656,505	338,236
CUTTHROAT	313,145	28,180	18,882
STEELHEAD	1,381,289	42,068	24,986



SPECIES SUMMARY

CANADIAN CATCH — EXPECTED ADULTS — JUVENILES RELEASED

SEP EXPENDITURES $(000)

SEP Component	1989/90	1990191	Projected 1991/92
Reconnaissance & Feasibility	296	267	264
Major New & Expanded Production	3,206	3,425	1,416
Resource Restoration (New Minor Production)	2,230	2,355	2,208
Pilot Production Projects	–	120	60
1 Developmental	5,732	6,167	3,948
Facility Operations & Maintenance	19,062	19,355	19,981
Community Involvement	7,067	7,341	7,281
Lake Enrichment	1,802	1,629	1,671
Canada/U.S. Operations & Maintenance	1,922	1,933	2,125
2 Operational	29,853	30,258	31,058
ManageabilityStudies/Mark Recovery	250	300	234
SEP Evaluation Framework	135	171	288
SEP Biological Research	0	251	210
PacificSalmon Foundation	55	36	34
Direction	514	711	312
3 Program Support	954	1,469	1,078
SEP-MANAGED PROGRAM	36,539	37,894	36,084
SEP-Related Research	1,745	1,745	1,745
Fisheries Manageability Studies	364	374	374
Planning & Economics Branch	763	773	773
Applied Research	549	559	559
Support Services-Branches	331	336	336
4 SEP-Related Program Support	3,752	3,787	3,787
TOTAL SEP PROGRAM (excludes CEBP)	40,291	41,681	39,871
Facilities Renewal-Health & Safety Requirements	–	558	–
Emergency Flood Damage Repairs	–	1,640	–
Retroactive Salary for Previous Years	–	359	–
5 Extraordinary Items For One Year Only	0	2,557	0
TOTAL FEDERAL PROGRAM (excludes CEBP)	40,291	44,238	39,871
6 Provincial Program (Government of B.C. share)	1,470	1,470	1,470
TOTAL-FEDERAL AND PROVINCIAL	41,761	45,708	41,341

NOTES

1. This year the SEP Expenditure table is being presented in a new format which shows the current budget status of the program. For illustrative purposes, SEP activities in the Pacific Region are separated into six components; (1) Developmental, (2) Operational, (3) Program Support, (4) SEP-Related Program Support, (5) Extraordinary Items for One Year Only and (6) the Provincial Program.

Using 1990/91 figures, SEP federal activities cost approximately $44.2 million. Of this, $3.8 million was allocated to other branches [component (4)] and $37.9 million was expended by SEP branch [components (1) + (2) + (3)]. "Extraordinary Items for One Year Only" [component (5)] was funded by Department of Fisheries and Oceans headquarters to cover emergency flood repairs, facilities renewal to meet health and safety requirements, and previous years' salary adjustments arising from a contract settlement.

2. Total expenditures exclude CEBP (Contribution Employees Benefit Package). This is approximately $1.7 million per annum of salary expenditures paid by the Department of Fisheries and Oceans headquarters.

3. The contribution by Western Economic Diversification was $13.5 million in 1990/91. It is $17.5 million in 1991/92.

4. The projected expenditures in 1991/92 are adjusted for a program reduction of approximately $1 million. A reduction of approximately $600 thousand was made due to an internal policy change with the implementation of the GST (Goods and Services Tax) and the removal of the FST (Federal Sales Tax).

5. Major repairs due to 1990 floods continue in 1991/92 for approximately $1.4 million, by reallocating funds from SEP Development to SEP Operations and Maintenance. This is one of the reasons for the reduction in developmental funding [component (1)] from 1990/91 to 1991/92.

6. SEP is involved in new initiatives under the Native Cooperative Management Program and the Green Plan in 1991/92. The expenditures for these initiatives by SEP are approximately $3.9 million and are additional to normal program budgets and therefore not included in the above table.